

The Conifer Woolly Aphids (*Adelgidae*) in China

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ABSTRACT The paper summarized the researches on the conifer woolly aphids in northeast and southwest of China, and briefly described the life cycle and economical significance of the species and 1 subspecies of the Chinese conifer woolly aphids.

Key words: *Adelgidae*, Taxonomy, China.

INTRODUCTION

Adelgidae is a small family in *Homoptera*, which has 71 species known and 1 subspecies in the world. After, Clusius, Holland botanist discovered galls on the spruce in 1583, the gallicolae in galls was described again by a lot of entomologists, they were as follows: Frisch, Dreyfus, Blochmann (1887~1889), C. Börner (1908), H. A. Cholodkovsky (1915), P. N. Anand (1928), M. Inouye (1945) and A. Binazzi (1984) et al. They had studied the taxonomy, biology and ecology of *Adelgidae*, also exposed the complex life cycle, host and classification system of the woolly aphids.

As the study on classification system of *Adelgidae* has been carried on more than one hundred years, subfamily *Cherminae* in family *Phylloxeridae* has changed to nowadays independent family *Adelgidae*. Genus *Chermes* Htg. changed into genus *Adelges* Vallot, and the family *Adelgidae* again was also divided into 2 subfamilies, 4 tribes, 9 genus, therefore formed the contemporary classification system of *Adelgidae* today as follows:

Family *Adelgidae*

Subfamily 1, *Pineinae*

Tribe 1, *Pineini*

Genus 1, *Eopineus* Steffan

Genus 2, *Pineus* Shimer

Genus 3, *Pineodes*

Tribe 2, *Dreyfusiini*

Genus 4, *Dreyfusia* Börner

Genus 5, *Aphrastasia* Börner

Subfamily 2, *Adelginae*

Tribe 3, *Adelgini*

Genus 6, *Cholodkovskya* Börner

Genus 7, *Adelges* Vallot

Tribe 4, *Sacchiphantini*

Genus 8, *Gelletteella* Börner

Genus 9, *Sacchiphantes* Curtis

The Studies on *Adelgidae* in China began later. From 1960 to 1966, Li Zhaolin and Chai Banghua studied adelgids on the larch in northeast of China, they had recorded briefly the life-histories of 4 species of the larch adelgids. Afterwards, during 1983-1984, Fang Sanyang et al. investigated the result of woolly aphids injuring Korean pine (*Pinus koraiensis*), and studied woolly aphids injuring fir and spruce in Fenglin Natural Reserve in northeast of China. Except these researches, Zhang Guangxue et al. described two new species and a new subspecies of *Adelgidae* in Western Sichuan Province, and studied their hosts and life cycle.

Generally, the conifer woolly aphids have two hosts, and complete one holocyclic in two years. The first host is spruce, and the secondary host is all other conifer trees. But some of these species have only one host, it is only on the first or secondary host to complete their life cycle in one year, which are called as anholocyclic species. One holocyclic specie has a lot of life stages: Sexualize, fundatrix, galls and gallicolae on the first host and pseudofundatrix, exules, sexupara on the secondary host.

THE KNOWN SPECIES IN CHINA

On the Korean pine (*Pinus koraiensis* Sieb. et Zucc.) We discovered and described one new subspecies and two new species of woolly aphids (*Adelgidae*) from Xiaoxing'an Mountain, they were as follows: *Pinus cembrae pinikoreanus* Zhang et Fang, *Pineus corteciculus* Fang et Sun and *Pineus cladogenous* Fang et Sun.

P. cembrae pinikoreanus Zhang et Fan was described on the basis of characteristics of heimosistens adult and sexupara alatae. This subspecies was similar to *P. cembrae* (Cholodkovsky), but the positions and numbers of marginal wax groups on the abdomen were different. Typical region of distribution was Dailing of Xiaoxing'an Mountain in Heilongjiang Province. In the

middle of June in 1981, we discovered new galls of *Subsp. pinikoreanus* on *Picea jezoensis* Carriere at edge of primeval forest in the Fenglin Natural Reserve. In middle of December of the same year at same locality. We collected overwintering 1st. instar larvae of fundatrix. Now, we have already collected galls, fundatrix, sexuparas, hiemosistens, gallicolae except the sexuales. The gall shape of *subs. pinikoreanus* was looked like that of *P. cembrae*, but the shape and numbers of dorsal gland facet on the wax plates as well as distance among these wax plates in 1st instar larvae of fundatrix were different from that of *P. cembrae* (Cholodkovsky). Characters of *subs. pinikoreanus* are: numbers of dorsal gland facets on the wax plates are less, the shape of these gland facets tend to round, only one or two is large and obvious, every wax plate is rectangle, the 4 angles are more acute, arrangement of wax plates is farther each other.

This subspecies was a serious pest of young Korean pine, in northeast of China. The main factor that the woolly aphid breaks out was light-intensity in the forest. If the light condition was very good in the forest, the pest injured pine needles more seriously. Two species of genus *Pineus* were collected on the Korean pine from Xiaoxing'an Mountain and Botanical Garden of Harbin, and described as new species in 1985. They inhabited under bark and in tissue of tree respectively and overwintered there in larvae. These species are: *Pineus cladogenous* Fang et Sun and *P. corteciculus* Fang et sun. It is difficult to collect these species, therefore they have not been summarized economic signification. They complete all life cycle only on the Korean pine as anholocyclic species.

On the Larch Li Chaolin et al. (1973) and Zhang Guangxue et al. (1980) had recorded briefly the life-histories of 4 species and 1 subspecies of the larch adelgids, in northeast and southwest of China. They were *Adelges laricis* Vall. and its *subs. potaninilaricis* Zhang, *Sacchiphantes viridis* Ratz., *S. roseigallis* Li et Tsai and *Cholodkovskya viridana* Chol.

One of these larch adelges (*Adelges laricis* Vall) widely distributed in primeval or man-planted larch forests of northern China, and the range was from Daxing'an Mountains, Xiaoxing'an Mountains, Changbaishan, Altai, TianShan, across Qinlin Mountain up to Northern part of Hengduan Mountains (The subalpine coniferous forest Zone of Western Sichuan Province). *Adelges laricis* is a species of Alegees which has widely distribution and largest number in man-planted larch forests in plain of North of China. At present, Zhang Guangxue et al.(1980) described a new subspecies *potaninilaricis* from Western Sichuan Province. The subspecies distributed in different regions of China.

Other 3 species of woolly aphids on the larchs are : *Sacchiphantes viridis* Ratz., *S. roseigallis* Li et Tsai and *Cholodkovskya viridana* Chol. Their distribution areas is small and the numbers of the individuals are few, therefore they have no description of economic sense.

On the Fir One species of woolly aphids was collected on the fir (*Abies nephrolepis* Maximowicz) from Xiaoxing'an Mountains. It was *Aphrastasia pectinata* Chol., overwintered in 1st instar of pseudofundatrix at underside of fir needles. Its activity began in early May. Adult lays eggs in the middle or late of May. After most of eggs grew into sexupara alatae, they return to spruce. Sexupara alatae is holocyclic species. Its 1st host is *Picea koraiensis* Nakai and *Picea jezoensis* Carriere, and 2nd host is *Abies nephrolepis* Maximowicz in Xiaoxing'an Mountains.

Zhang Guangxue et al. collected one species of woolly aphid on fir needles and described as new species (*Gilleteella glandulae* Zhang). Its type location was Baoxing county, Sichuan Province, China (2450 m elevation). It was holocyclic species. Its 1st host was *Picea brachytyla* and *P. likiangensis*, 2nd host was *Abies fabri*.

The genus *Gilleteella* was previously recorded from China, and the record that it injured fir needles in southwest China was first time too.

On the Spruce We only mentioned two anholocyclic species of woolly aphids on *Picea*, they were:

1) *Adelges japonicus* (Monzen) was only lived on *Picea jezoensis* Carriere in Xiaoxing'an Mountains. Its 2nd host was larch.

2) *Pineus Sichuanus* Zhang was collected by Zhang Guangxue et al. on different spruce, it was as follows: *Picea likiangensis* Pritz., *P. likiangensis* var. *halfouriana* Hillier et Salvin and *P. brachytyla* Pritz. from western Sichuan Province and described as new species in 1980. It was anholocyclic species on spruce too, its 2nd host was Pine.

CONCLUSION

conifer woolly aphids were main pests of conifer trees in China. The researches on conifer woolly aphids began in 1973, 10 species and 2 subspecies have been studied. At first, the life cycles was observed. Then control methods were researched.

Light-intensity in stand was the main factor of woolly aphids breaking out. If the light condition in stand were controlled probably, the breaking out of woolly aphids would be controlled. Strict quarantine was also very important to prevent from conifer woolly aphids.

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(Responsible Editor: Zhu Hong)